Safety and Health is Good Business

How to Identify and Control Hazards

A Workbook

Important Note:

All the publications in the Publications Archive contain the best guidance available at the time of publishing. However, you should consider the effect of any changes to the law since then. You should also check that the Standards referred to are still current.

OCCUPATIONAL SAFETY & HEALTH SERVICE

Published by the Occupational Safety and Health Service
of the Department of Labour
December 1992
Revised January 1994

ISBN 0-477-03515-9

CONTENTS

INTRODUCTION

The identification and control of hazards is not a simple matter. It has become more difficult as the depth of technology has increased. Physical hazards no longer lie on the surface, accessible to a simple inspection.

There is, however, no single ideal system of hazard identification and control. The most appropriate systems vary to some extent with the type of industry and processes involved, and in fact there is usually the need for a combination of methods to be used.

This workbook gives an outline of the more common processes that can be worked through to identify — in a systematic way — existing hazards in workplaces.

It is divided into three sections, covering:

1. *Methods to identify hazards.*
2. *How to assess the risks posed by hazards and identify significant hazards.*
3. *Arriving at appropriate control measures for hazards.*

Throughout this booklet there is room for you to write notes that you can use for future reference, e.g. hints to help you when you are carrying out these activities in your company.

HAZARD IDENTIFICATION

INTRODUCTION

Three effective ways to systematically identify existing hazards are:

1. **By examining specific areas of the worksite and the activities carried on in them.**
2. **By analysing different occupations and their tasks.**
3. **By analysing the total process used to convert raw materials into final product for sale.**

HAZARD IDENTIFICATION BY AREA

Static worksites such as factories are well suited to a hazard identification method involving grouping hazards into common types (refer appendix A) and identifying them by surveying all the different areas of the site.

Outline of the process

1. *Get an up-to-date plan of the worksite*. This must provide an accurate picture of the work area.
2. *Get a chart that shows the process of production or work flow*. If one doesn't exist, then compile such a chart.
3. *Divide the worksite into identifiable areas and number them*. This division can be based on how the production is carried out or the physical layout of a site.

For example, a small factory may contain:

Stores area — Production area — Workshops — Offices — Yards

4. *Ask staff in all areas to list what they consider are potential hazards* in the places they work and why they consider that they are hazards/potential hazards. Also get them to make a list of the chemicals/substances they use. Use a data collection form like that given in appendix B to gather the information. Be sure to attach the hazard information sheets to the form, so people know what type of hazards they are looking for.

NOTE: The form can be part of a manual collection system or pro-forma printout from a computerised system. Use the method best suited to your organisation, but remember your process of hazard identification may need to be AUDITED — so make sure there is a "trail" established.

Don't just hand out the forms, but organise a meeting to explain the information needed and why it is being collected. Similar types of hazards can be grouped together. It is not necessary for every person to have a form but it is important for every person to contribute to the information-gathering process. It is also important that no judgements are made at this time as to the likelihood that harm would result from the hazard.

5. *Use existing resources* such as regulations, codes of practice, information booklets, manufacturers' information, reports from inspectors/consultants, complaints, environmental monitoring reports and:
   - Especially use records of accidents/illnesses and near misses, not only within your company but also within your industry, to ensure all hazards are identified.
   - Summarise the information collected. A sample sheet which illustrates how this can be done is included in this workbook.

The list of hazards collected must allow identification of specific hazards to specific areas or activities. A broad list of hazards in the workplace is of VERY LITTLE USE for the purposes of hazard control.

HAZARD IDENTIFICATION BY WORK ANALYSIS

Work that is not done on a static site is probably better analysed by first identifying the different occupations involved and the work people carry out, then the hazards they face doing that work.

This method is better suited for those work activities where there is a considerable degree of scope for the worker to decide how the task is carried out, e.g. tradespeople.

This analysis would be applicable for work in construction, forestry operations and similar work where people tend to work in small autonomous groups with minimal supervision.

A major problem with this approach is the hazards that are not part of someone's work will not be identified, e.g. storage areas for waste chemicals.

Outline of the process

1. *Identify all the tasks people carry out.* A task consists of a number of steps, actions or stages performed in order to complete a specific work assignment.

   This can initially be done by asking people what they do. Break the work down into small enough components to be analysed, but NOT so small as to make the analysis too impractical. There may already exist a task breakdown of the work carried out (e.g. when implementing quality assurance systems).

2. *Work out the steps or stages involved in doing the task* — using the sheet provided in appendix C or one you have drawn up yourself, and getting those involved to help.
3. Using the list of hazards in appendix A, ask those involved *what they consider apply to each step identified* and to write them down.
4. *Use existing resources* such as guidelines, codes of practice, information booklets, manufacturers' information, reports from inspectors/consultants, complaints, environmental monitoring reports; and

   Especially use records of accidents, illnesses and near-misses — not only from within your company, but also within your industry — to ensure all hazards are identified.
5. *Use the information derived from task analysis to build up a profile of hazards and the occupations and tasks they apply to*. This can be done on a computer database using key words so hazards common to a wide range of occupations can be identified.

The list of hazards collected must allow identification of specific hazards to specific activities. A broad list of hazards that applies to all the tasks/occupations in the organisation is of VERY LITTLE USE for the purposes of hazard control.

HAZARD IDENTIFICATION BY PROCESS

A more technical approach to hazard identification is to identify the processes involved on a worksite and go through each process step-by-step, identifying the hazards at each step of the process. With plant of any complexity, the time taken to identify individual potential hazards can be larger than the time taken to quantify the risk of the hazards.

The process outlined below is NOT to be confused with "an engineering type" identification process such as "Hazard and Operability Studies", "Fault Tree Analysis" and "Human Error Analysis".

Outline of the process

1. *Make an inventory of all substances/chemicals used in the process.*
2. *List the process from where the material is delivered to the factory/site to where the finished goods are dispatched.* Identifying the steps where material is transformed by physical and chemical means.
3. *Draw up a flow chart* detailing every step of the process and detailing the various stages where chemicals and substances are used in the process.
4. *Identify all the hazards at each stage of the process*.
5. *Use existing resources*, such as regulations, codes of practice, information booklets, manufacturers' information, reports from inspectors/consultants, complaints, environmental monitoring reports; and

   Especially use records of accidents, illnesses and near-misses, not only within your company but within your industry, to ensure all hazards are identified.
6. Summarise the information collected.

The list of hazards collected must allow identification of specific hazards in particular parts of the process. A broad list of hazards in the process is of VERY LITTLE USE for the purposes of hazard control.

RISK ASSESSMENT

INTRODUCTION

After all the existing hazards faced by workers in an organisation are identified, decisions have to be made as to:

- Whether they are significant hazards and thus need a specific hierarchy of control measures to be applied; or
- Whether any control methods are to be introduced to reduce or eliminate the likelihood of injury from those hazards which are not identified as significant hazards.

A risk assessment has three purposes

- To consider the chance of harm actually befalling anyone in particular circumstances, and the possible consequences which could result.
- To enable you to plan, introduce and monitor preventive measures to ensure that the risks are adequately controlled at all times. Without effective assessment, there can seldom be effective control.
- To meet responsibilities for identifying and controlling significant hazards as defined in the Health and Safety in Employment Act 1992.

Key points about assessments

- Assessments must be adequate. They must be sufficient to guide an employer's judgements about measures they should take to fulfil their legal obligations.
- Assessments must cover all the risks to the health and safety of employees to which they are exposed at work.
- Assessments must cover risks to non-employees who may be affected by what the employer does (e.g. members of the public or other contractors at the same workplace).
- Whenever new or changed risks are encountered, the employer must revise his or her original assessment. A regular review is advised as part of good management practice.
- Where groups of employees are especially at risk, the groups must be identified as part of the assessment (e.g. young, inexperienced or disabled workers).

OUTLINE OF THE PROCESS

Each identified hazard needs to be processed so a decision is made on whether:

- Injury or illness could result from it; and if so,
- What action is to be taken to reduce the risk.

This is a decision-making process and must be followed in a systematic manner. At the same time, however, there is an opportunity to "calculate the risk" due to any hazard, and so determine the relative seriousness of each hazard (i.e. as compared to each other). THIS SCORE IS NOT TO DECIDE WHETHER TO CONTROL THE RISK POSED BY THE HAZARD. It indicates the priority for remedial action.

The process outlined on the following pages can be applied to each hazard. This process is documented on a risk assessment recording sheet (an example of which is given as appendix D).

Step 1

- Select the area or task from where the hazards are to be assessed; and
- Select in turn each hazard identified.

Step 2

Ask the question:

How could any injury, illness or damage result from this hazard?

Note: It is not always apparent that an injury, illness or damage can result from a perceived hazardous situation. Brainstorming this will enable you to answer more accurately the next question.

If the answer is NO, list the evidence why not and move on to the next hazard (or group of hazards).

Note: If you decide that an injury is not possible from the situation listed as a hazard, then list the reasons why. For example, suggested inadequate lighting meets the NZS for light level in room, and there have never been any reports/ complaints of trips due to inadequate lights. Remember, someone must have considered the situation a hazard, so be doubly sure before making a decision.

Step 3

At this stage in the process you have a list of hazards that could result in injury, illness or damage.

Ask the following questions to establish:

a) A potential severity rating

- *What degree of injury or illness could occur?*
- *Fatality?*
- *Major injuries/illness (including possible long-term disabling effects)?*
- *Minor injuries/illness?*
- *Negligible injuries/illness?*

b) A probable frequency rating

- *With this hazard, how likely is it that an injury or illness will occur?*
- *Happens all the time?*
- *Has happened previously within the company?*
- *Strong possibility of it happening?*
- *Known to have happened in the past?*
- *Remotely possible?*

Step 4

Compile a risk rating number by using the rating table (see below — i.e. multiply the ratings derived from the above questions). Such a risk rating enables the most serious hazards (i.e. those with the highest numbers and hence the highest priority) to be considered first.

At this stage you have a risk rating for each hazard. Remember this is for prioritising purposes only.

PROBABLE FREQUENCY	SEVERITY 4	3	2	1
5	20	15	10	5
4	16	12	8	4
3	12	9	6	3
2	8	6	4	2
1	4	3	1	1

Step 5

You now have a list of identified hazards and have assessed the likely severity of the harm from the hazard and the likelihood of that harm occurring.

Now the list can be separated into significant hazards and other hazards.

Ask the following questions:

Is the hazard an actual or potential cause or source of:

- *Serious harm as defined in the Health and Safety in Employment Act?; or*
- *"Harm the severity of which may depend on how often or how long a person is exposed to the hazard", e.g. Occupational Overuse Syndrome; or*
- *"Harm that does not usually occur, or usually is not easily detectable, until some significant time after the hazard", e.g. asbestosis*

It is important at this stage to make sure you have all the evidence needed to make a decision. If in doubt, get expert advice and consult widely. The information gathered during the hazard identification process will be valuable.

If NO, list the evidence why not and move on to the next hazard (or group of hazards).

If YES, detail what the harm could be and add the hazard to the significant hazard list.

You will now have two lists:

- SIGNIFICANT HAZARDS
- OTHER HAZARDS

developed from the original list of identified hazards.

Match the identified hazards with the measures which exist at present for controlling them, and state whether more needs to be done for the control measures to be effective. Remember, the significant hazards have to be dealt with in a specific manner. The following section on hazard control covers this in more detail.

HAZARD CONTROL

INTRODUCTION

Hazards in a workplace are controlled by a combination of "local controls" specific to a hazard, and "management controls" for ensuring that these are implemented and remain active. THIS IS AN IMPORTANT PRINCIPLE TO REMEMBER.

The implementation of controls to fix a specific hazard, e.g. chains to prevent gas cylinders toppling over, or hearing protectors to reduce exposure to noise, must be supplemented by management activities to ensure they are being implemented, that they are adequate, and that they remain effective.

The mechanism for the control of a hazard may not necessarily be a physical one, but may be a rule or practice designed to reduce the risk from the hazard.

It is necessary to ensure that once hazard controls are put in place they stay in place and are used, and it is also necessary to provide a feedback mechanism for ensuring whether or not the controls are adequate and responsibilities are understood by all.

CONTROL OPTIONS

When a hazard has been identified and assessed as needing some control measure, then the next process to go through is the selection of which option is required. The final choice of an option is based on factors such as the potential severity of harm posed by the hazard, the likelihood of injury or illness occurring, the cost of control measures, or whether it has been identified as a significant hazard.

It is important, however, to LOOK AT ALL OPTIONS before making a decision, even though the identified hazard may already have some controls in place.

CONTROL OF SIGNIFICANT HAZARDS

Hazards that are assessed as "significant" present such a degree of risk that the Act requires a more formal approach in dealing with them. (See the Act for the definition of "significant".)

The primary aim is the elimination of significant hazards if practicable.

Sections 8, 9 and 10 of the Health and Safety in Employment Act 1992 contain specific requirements for the control of significant hazards.

These sections require that the following steps are to taken once significant hazards have been identified in an organisation:

1. Significant hazards to employees are to be eliminated where practicable.
2. If this is impracticable, those hazards are to be isolated.
3. If this is also impracticable, all practicable steps must be taken to minimise the likelihood that the hazard will be a source of harm to the employees. If this step is followed:
   - It must include the supply and use of protective equipment; and
   - Employee exposure to the hazard must be monitored, and health monitoring carried out with employee consent.

Once the significant hazards in the workplace have been identified, it is necessary to decide which of the three steps is to be used to control each hazard.

Outline of the process

For each of the previously identified significant hazards the following questions must be asked in order:

- *Can the hazard be eliminated?*

If so, list the steps to achieve this or, if not, why not?

TEST YOUR REASONS FOR NOT ELIMINATING IT AGAINST THE "ALL PRACTICABLE STEPS" REQUIREMENTS ,

OR IF NOT, THEN

- *Can the hazard be isolated from the employees?*

If so, what steps are needed or, if not, then why not?

TEST YOUR REASONS FOR NOT ISOLATING IT AGAINST THE "ALL PRACTICABLE STEPS" REQUIREMENTS,

OR IF NOT, THEN

- *What will be done to minimise the likelihood of harm from the hazard?*
- *What equipment and clothing are needed to protect employees from the harm?*
- *How are employees' exposure to the hazard and their health in relation to the exposure being monitored?*

List the answers and then

TEST YOUR STEPS FOR MINIMISING THE LIKELIHOOD THAT THE HAZARD WILL CAUSE HARM AGAINST THE "ALL PRACTICABLE STEPS" REQUIREMENTS

The hierarchy of steps above ensures that supplying employees with protective equipment to guard against the hazard is not done without first considering and evaluating the other more effective options.

CONTROL OF OTHER HAZARDS

The process used for significant hazards may also be used to determine the control methods for other hazards. However, should you choose not to, then the following process can be used.

The process outlined

For each "other hazard" ask these questions in the following order:

- *Can the hazard be removed by design and engineering?*
- *Can the hazard be removed by substitution?*
- *Can the risk from the hazard be reduced by changing the process?*
- *Can the risk from the hazard be reduced by enclosing it to isolate it from workers?*
- *Can the hazards be removed at source before they can affect the workforce?*
- *Can the hazard be reduced by segregating the process from workers other than those needed to the process?*
- *Can personal protective equipment be used to reduce the risk of injury?*
- *Can rules or procedures be developed to reduce the risk of injury?*

After putting the hazards through either process, detail the controls that will be

put in place and how you intend to implement these hazards. (Refer to the example of a hazard control plan given in appendix E.)

It is important to realise that the methods and systems for the control of hazards, whether significant or not, DO NOT exist in isolation from the other activities organisations undertake in order to carry out their business. The hazard identification and control processes must be part of the normal management process.

Management controls

These are the activities that an organisation uses to manage a safety and health programme. There are usually a number of basic management control activities that are common to all hazards, although some hazards may require more. These include:

- Involvement of employees in the development of health and safety procedures.
- An information system to ensure employees are informed about and understand the risks from hazards they work with.
- An accident reporting and investigation system.
- Regular surveys of the workplace.
- Responsibilities being assigned to ensure hazard controls are implemented and remain effective.
- An audit system for checking that the controls for specific hazards are in place and working.
- An adequate training programme and adequate supervision for all staff.
- Implementing emergency procedures, perhaps in conjunction with local emergency services, to limit the consequences of an emergency.

Responsibility

Responsibilities are assigned to ensure that the existence of each hazard is made known to all those exposed to it, and that they are instructed in the use of the correct procedures when exposed to the hazard.

Example

An illustration of the connection between the management control activities mentioned above and the local control activities can be made by looking at the following simple example, where the hazard could not be eliminated or isolated.

Hazard:	Exposure to talc when emptying bag into hopper.
Assessment:	Sustained inhalation of significant amounts of talc can produce symptomatic pneumoconiosis. MSDS sheet supplied with product states precautions needed.
Local controls:	- Ventilation hood over hopper (interlocked with process). - Protective face mask (worn when emptying bags). - Disposable overalls.
Management controls:	- Plant survey every month to check procedures and the efficiency of ventilation system. - Training for staff in hazards of talc and reasons for protective clothing. - Audit every year to ensure training is given and that hazards and responsibilities are known about and understood.

- Medical examination of people using talc every three years as part of ongoing monitoring process.
- Test every six months to what extent staff are exposed to talc. Use personal monitoring method.
- Employees given the results of monitoring.

Cost of controls

There will be a variety of control methods for different hazards. The degree of control agreed upon will involve a consideration of the cost, the severity of the consequences, and the probability of the injury/illness/damage.

To determine the most appropriate of the proposed options for the identified hazard, the estimated cost of the corrective measures is weighed against the degree that the risk is reduced (refer appendix F). Remember that significant hazards have a test of "all practicable steps" for the control required, which involves a mix of considerations, including cost.

Changes to processes or new processes

There needs to be a system in place that, before processes are changed or new processes/activities undertaken, will ensure potential hazards resulting from these changes are identified, assessed and controlled if necessary.

A project team can be established to identify hazards in the new activity, and appropriate controls. Emphasis should be placed on "designing out" the hazards where possible.

An audit or review of existing or new hazards must be carried out on a regular basis to test the effectiveness of the selected control measures.

Appendix A
Brief notes on different types of hazards

Chemical hazards

Chemicals can affect the skin by contact or they affect the body either through the digestive system or via the lungs if air is contaminated with chemicals, vapour, mist or dust.

There can be an acute effect, i.e. the person is affected immediately, or there can be a chronic effect, i.e. the person is affected in the medium to long term due to the accumulation of chemical or substances in or on the body.

Noise hazards

Excessive noise can disrupt concentration, interfere with communication, and result in loss of hearing. High impact noises are particularly damaging. Noise can also mask out signals, affecting communication.

Radiation hazards

Ionising radiation is in such equipment as radioactive gauging devices or the radioactive trace element used in analytical chemistry. Non-ionising radiation covers infrared radiation (heat-producing processes), lasers, ultraviolet radiation (welding, sunlight), and microwaves (high-frequency welders, freeze drying).

Electrical hazards

This covers the risk of injury from all forms of electrical energy.

Lighting hazards

Inadequate lighting levels are a potential safety hazard. A common problem area is the reaction time needed for the eyes to adjust from a brightly lit to a darker environment — such as forklift driver coming indoors from bright sunlight. Temporary lighting is often inadequate.

Vibration hazards

This includes whole-body vibration — e.g. truck drivers, people standing on vibrating platforms, and operators of mobile equipment — and also segmental vibration effects from such equipment as hand tools, chainsaws, and pneumatic hammers.

Temperature hazards

Extremes of cold or heat can cause problems due to individual fatigue or reduced capacity to work.

Biological hazards

These include insects, bacteria, fungi, plants, worms, animals and viruses. For example, poultry workers exposed to bird feathers and droppings to which they are allergic can contract a medical condition. Brucellosis is a well known problem in New Zealand associated with people handling meat and meat products infected with brucella. Hepatitis and the AIDS virus are other biological hazards.

Ergonomic hazards

This covers risk of injury from manual handling procedures, incorrectly designed work stations, audio and visual alarms, and colour coding control mechanisms.

Physical hazards

This includes a wide range of risks of injury — as diverse as being caught in or by machinery, buried in trenches or hurt by collapsing machinery. This category also includes the hazards from working in confined spaces, being hit by flying objects, caught in explosions, falling from heights and tripping on obstacles.

Miscellaneous hazards

This includes stress, fatigue, the effects of shiftwork, and even assaults from other people.

APPENDIX B
SAMPLE HAZARD IDENTIFICATION DATA SHEET

HAZARD IDENTIFICATION	**XYZ GAS COMPANY**
Plant Area	Gas Bottle Return #2
Person responsible for hazard identification	Pauline Stewart Team Leader
Date of hazard identification	November 1991

Potential hazard	*Where*	*Hazard type*
Bottles falling off trucks and over	Whole area	Noise/physical
Caught between truck and dock	Dockway	Physical
Doors open all winter	Whole area	Temperature
Dyna bolts in floor	Floor dockway	Physical
Lifting bottle by hand up stairs	Repair room stairs	Ergonomic
Forklift goes too fast - no warning	Whole area	Physical
Too dark in repair room	Repair room	Lighting

List chemicals used or stored in this area

Gas bottle cleaning solution - (no name)	
Floor cleaning detergent	Material Safety Data Sheet provided

HAVE ALL PEOPLE BEEN ASKED FOR THEIR IDEAS?

Signed . . . . . Date . . . . . .

APPENDIX C
SAMPLE RISK ANALYSIS DATA SHEET

XYZ MAINTENANCE COMPANY

Occupation:	Painter	Task # 1: Painting a water tank
Prepared by:	Denise Wilkie Painter	
Date:	21 November 1991	

STEPS	HAZARD
Wash down surface	Exposure to cleaning solution
Sand surface	Dust and lead in old paint
Wash down surface	Exposure to cleaning solution
Apply spot primer	Exposure to solvents when thinning primer
Apply coats	Exposure to fumes and solvents
Wash brushes	Exposed to solvents if solvent based

Other hazards

Excessive UV from sun

Falls from scaffolds/ladders

Signed . . . . . Date. . . . . .

APPENDIX D
HAZARD AND RISK ASSESSMENT RECORD SHEET

Location . . . . . .

HAZARDS FREQUENCY/ SEVERITY/ RATING

1) . . . . . .

2) . . . . . .

3) . . . . . .

4) . . . . . .

5) . . . . . .

FACTORS AGGRAVATING OR LESSENING RISKS

. . . . . .

. . . . . .

APPENDIX E
HAZARD CONTROL PLAN

To be developed in consultation with management and employees with specialist advice as appropriate.

HAZARD TO BE CONTROLLED

A. HAZARD CONTROLS

RESPONSIBILITIES

1) To implement

2) To monitor

TIMEFRAME FOR IMPLEMENTATION

B. MANAGEMENT CONTROLS

RESPONSIBILITIES

1) To implement

2) To monitor

TIMEFRAME FOR IMPLEMENTATION

NOTE: *Risk assessment may be repeated to evaluate the appropriateness of control measures.*

APPENDIX F
COST CONSIDERATIONS

COST

POSSIBLE CONSEQUENCES

PROBABILITY OF OCCURRENCE

DEGREE OF CONTROLS

LIST ALTERNATIVES
(Include costs, degree of control, etc.)

FURTHER INFORMATION

For further information contact your nearest office of the Occupational Safety and Health Service, Department of Labour.

Whangarei Ph: (09) 438-0552
Manukau Ph: (09) 262-5300
West Auckland Ph: (09) 833-5651
Penrose Ph: (09) 525-0268
North Harbour Ph: (09) 443-3460
Hamilton Ph:.(07) 957-3560
Tauranga Ph: (07) 578-2090
Rotorua Ph: (07) 347-9656
New Plymouth Ph: (06) 758-0516
Palmerston North Ph: (06) 359-1919
Napier Ph: (06) 835-7017
Lower Hutt Ph: (04) 566-8962
Wellington Ph: (04) 385-7771
Nelson Ph: (03) 546 8180
Christchurch Ph: (03) 366-5500
Dunedin Ph: (03) 455-0855
Invercargill Ph: (03) 218-2126