OVERVIEW OF MANUAL CHRA

3RD EDITION

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Presentation outline

- Background
- Overview of the content of Manual CHRA 3rd edition
- Main Changes from CHRA 2nd edition to 3rd edition

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Background

- There is a needs to review Manual CHRA 2nd edition due to:
  - Changes of classification system of hazardous chemicals with the implementation of CLASS Regulations 2013
  - Review of USECHH Regulations 2000 and others related legislations
  - Latest information and methodology/approach on health risk assessment
  - Feedback/inputs from industry and competence persons

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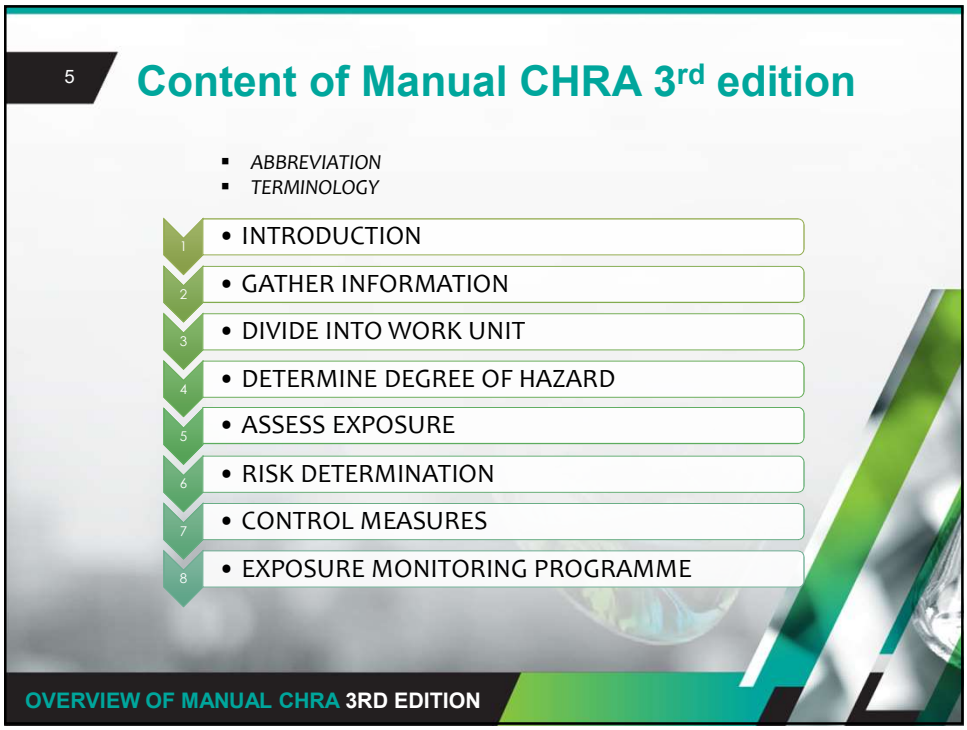
A Manual of Recommended Practice on

ASSESSMENT OF HEALTH RISKS ARISING FROM the use of CHEMICALS HAZARDOUS TO HEALTH AT THE WORKPLACE

Third Edition

(Manual CHRA 3rd Edition)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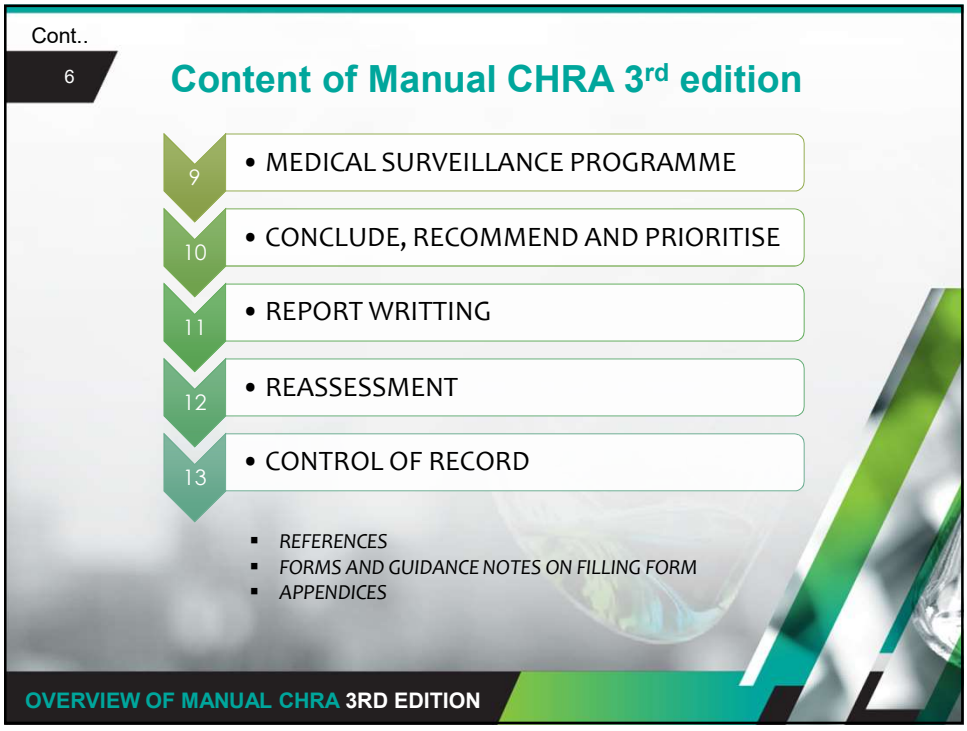
Content of Manual CHRA 3rd edition
ABBREVIATION
TERMINOLOGY
1 • INTRODUCTION
2 • GATHER INFORMATION
3 • DIVIDE INTO WORK UNIT
4 • DETERMINE DEGREE OF HAZARD
5 • ASSESS EXPOSURE
6 • RISK DETERMINATION
7 • CONTROL MEASURES
8 • EXPOSURE MONITORING PROGRAMME
OVERVIEW OF MANUAL CHRA 3RD EDITION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Content of Manual CHRA 3rd edition
9 • MEDICAL SURVEILLANCE PROGRAMME
10 • CONCLUDE, RECOMMEND AND PRIORITISE
11 • REPORT WRITTING
12 • REASSESSMENT
13 • CONTROL OF RECORD
REFERENCES
FORMS AND GUIDANCE NOTES ON FILLING FORM
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OVERVIEW OF MANUAL CHRA 3RD EDITION

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List of Appendices

- Appendix 1 : Conversion Table of R-phrase to H-code
- Appendix 2 : Routes of Exposure
- Appendix 3 : Pesticides Classification
- Appendix 4 : Example of Hazard Determination
- Appendix 5 : Geometric Mean and Geometric Standard Deviation
- Appendix 6 : Quantitative Determination of Inhalation Exposure Magnitude from Airborne Measurement Result
- Appendix 7 : Occupational Exposure Limits
- Appendix 8 : Qualitative Estimation of Exposures
- Appendix 9 : Solvent Drying Time
- Appendix 10 : Volatility Chart
- Appendix 11 : Direct Reading Instrument
- Appendix 12 : Checklist on Adequacy of Control Measures
- Appendix 13 : Biological Monitoring
- Appendix 14: CHRA Notification Form

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Overview Content & Main Changes from CHRA 2nd Edition to 3rd Edition

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Chapter 1: Introduction

- Scope
- Purpose and Objectives of a Chemical Health Risk Assessment
- Content of Chemical Health Risk Assessment
- Assessment Strategies
- Assessment Concept
- Select Assessor
- Steps in CHRA

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Scope of Manual

- Full assessment of risk to health where *chemicals hazardous to health* are *used* at the place of work
  - Chemical hazardous to health is a chemical which is:
    - ✓listed in Schedule I or II of the USECHH Regulations;
    - ✓classified in any hazard class specified under Health Hazards of First Schedule of the CLASS Regulations 2013;
    - ✓a pesticide as defined under the Pesticides Act 1974; and
    - ✓a scheduled waste listed in the First Schedule to the Environmental Quality (Scheduled Wastes) Regulations 2005.
  - Use in relation to chemicals hazardous to health includes work activities involving *production, processing, handling, storage, transport, removal, disposal or treatment* of chemicals hazardous to health at the workplace.

Purpose & Objective

- Purpose of conducting CHRA
  - enable decisions to be made on:
    - ✓ appropriate control measures;
    - ✓ induction and training of workers;
    - ✓ the necessity of exposure monitoring programme; and
    - ✓ the necessity of medical surveillance programme

  as may be required to protect the health of workers who may be exposed to chemicals hazardous to health at work

- Objectives of CHRA
  - Identify the hazards posed by each chemical hazardous to health use within the workplace;
  - Evaluate the degree of exposure of workers to the chemicals hazardous to health, either through inhalation, dermal or ingestion;
  - Evaluate the adequacy of existing control measures;
  - Recommend further appropriate control measures and prioritise actions to be taken to prevent or reduce risks.

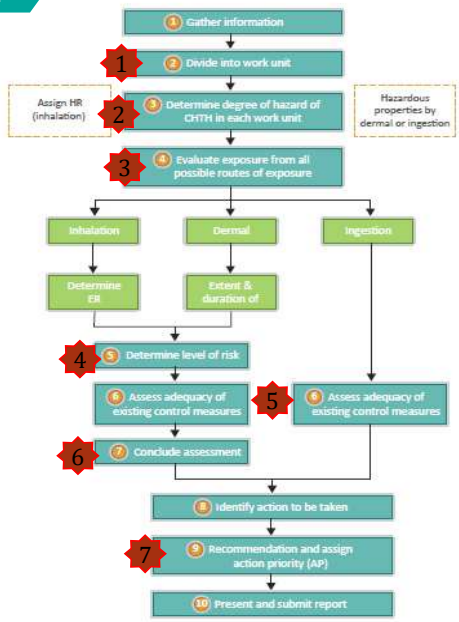
Assessment Strategies

- Full assessment
  - conducted using a CHRA method as outlined in this Manual
  - first approach considered
  - 2 types of assessment that can be conducted:
    - Site specific CHRA
      - conducted for each and every workplace where chemicals hazardous to health are used
    - Generic CHRA
      - conducted at representative locations which may be applied to all other locations in which the work activities are similar, with comparable levels of risk, and similar control measures
- Simple assessment
  - an alternative approach of chemical health risk assessment and may be conducted if the chemical hazardous to health is:
    - ✓ listed in the chemical register; and
    - ✓ not classified as carcinogenicity category 1; mutagenicity category 1; or respiratory sensitisation category 1.
  - can be conducted using a Simple Risk Assessment and Control for Chemicals methodology (SiRAC)

Assessment Concept

- Hazard
  - potential of a chemical to cause harm or adversely affect health of workers in the workplace
- Exposure
  - A worker is exposed to a chemical if there is a possibility of the chemical being inhaled; in contact with the eyes or skin; absorbed through the skin; or being ingested.
- Risk
  - likelihood that a chemical will cause adverse health effects or illness in the conditions of its use
  - risk to health usually increases with the severity of the hazard, the amount used, the duration and frequency of exposure
  - defined as the probability of over exposure and the consequences of that exposure
  - risk equation can be defined as
    - Risk = Hazard x Exposure

Steps to conduct CHRA



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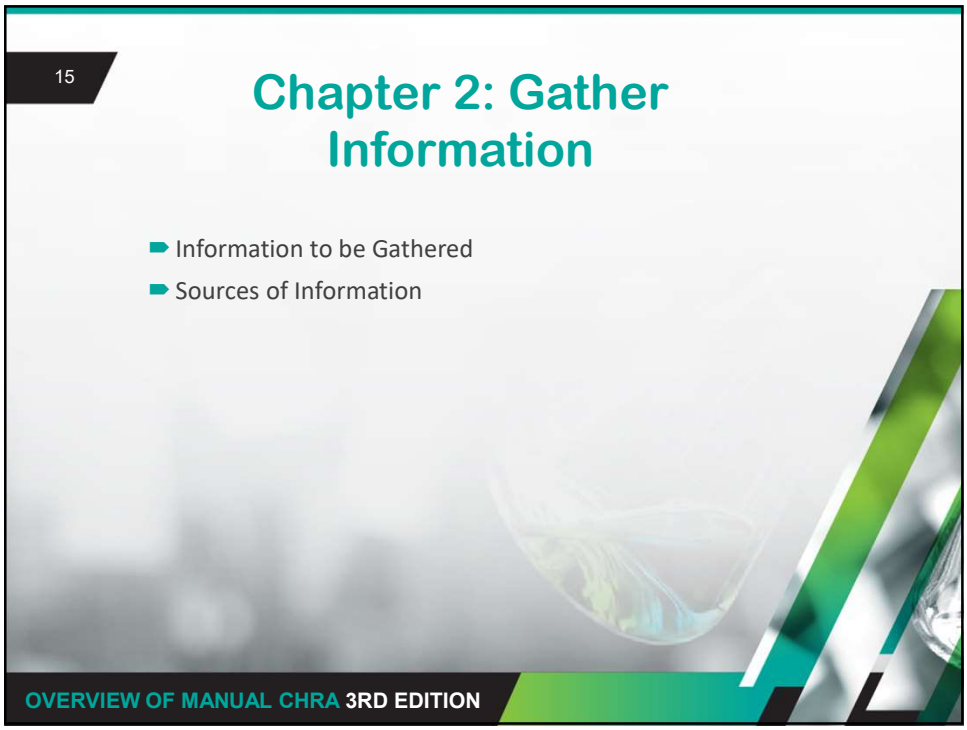
Chapter 2: Gather Information

- Information to be Gathered
- Sources of Information



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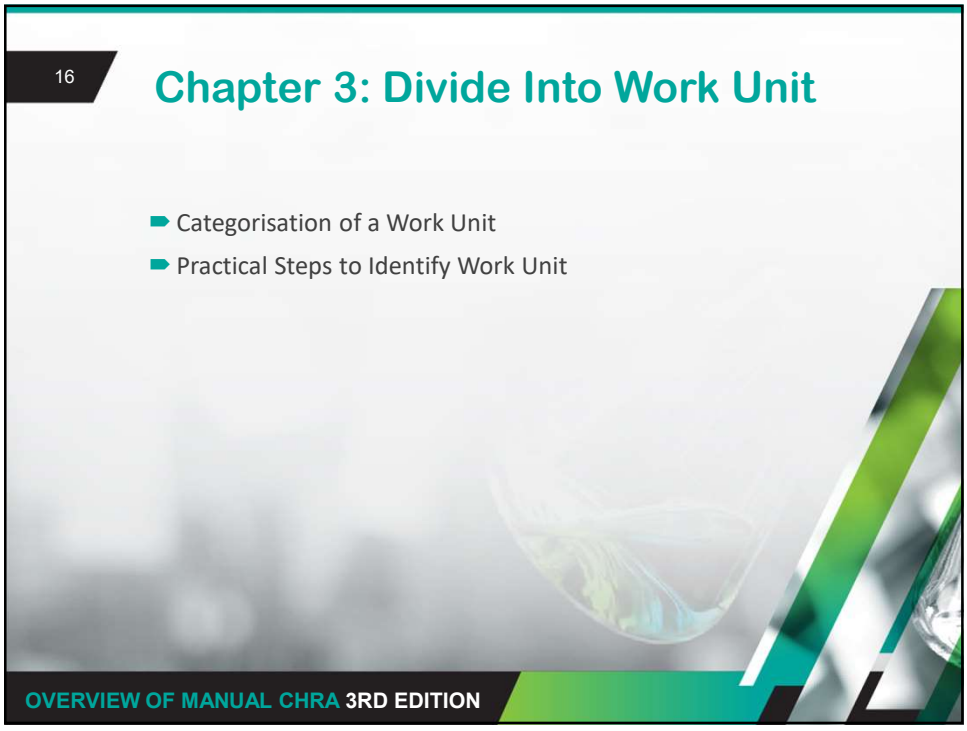
Chapter 3: Divide Into Work Unit

- Categorisation of a Work Unit
- Practical Steps to Identify Work Unit



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1 Change 1: Work unit definition

- A **work unit** must fulfil two basic requirements:
  - Work similarity
  - Similarity with respect to the hazardous agent
- The work unit could be a job, task or process.
- The work unit definition will only apply to the routine entry of persons into the workplace as described below:
  - Routine entry (employees, vendors, contractors) includes
    - Routine work (scheduled jobs, tasks, processes)
    - Non-routine work (for example, maintenance works, repairs, delivery, administrative work, management tasks, safety inspections, internal audits, etc.)
- For non-routine entry (visitors such as customers, external auditors, external inspectors) an assessment is not required and general control measures may be applied at the discretion of the employer.

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Chapter 4: Determine Degree of Hazard

- Identification of Hazard
- Degree of Hazard
- Example on Determination of Degree of Hazard by Inhalation and Dermal

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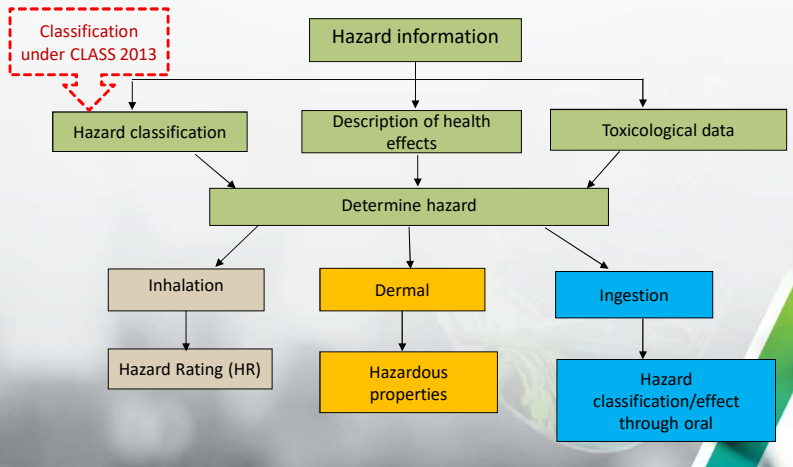
Change 2: Hazard determination for each route of exposure



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2a. Hazard Rating for Inhalation

- HR specifically for inhalation and is determine based on:
  - ✓ classification under the CLASS Regulations 2013;
  - ✓ health effect; or
  - ✓ acute toxicity data, LC_{50} for inhalation
    - Refer Table 1

Table 1: Hazard Rating for inhalation exposure based on health effect, hazard classification, hazard statement and acute toxicity data

HR	Health Effects	Hazard Classification	H-code: Hazard Statement	Acute toxicity
5	• Injury of sufficient severity to threaten life by single exposure; • Causing fatality at low doses or concentration; • Severe irreversible effects (e.g. central nervous system effects, kidney necrosis, liver lesions, anaemia or paralysis) after a single exposure; • Known to have carcinogenic potential for humans; • Known to induce heritable mutations in the germ cells of humans; • Known human reproductive toxicant.	Acute toxicity category 1 (inhalation)	H330	$LC_{50} \leq 0.5$ mg/l (vapours) $LC_{50} \leq 100$ ppmV (gases) $LC_{50} \leq 0.05$ mg/l (dusts/mists)
		Carcinogenicity category 1A	H350, H350i	
		Mutagenicity category 1A	H340	
		Reproductive toxicity category 1A	H360, H360D, H360F, H360FD, H360Fd, H360Df	
		Specific target organ toxicity – single exposure category 1	H370	
4	• Injury of sufficient severity to cause permanent impairment, disfigurement or irreversible change from single or repeated exposure; • Very serious physical or health impairment by repeated or prolonged exposure; • Presumed to have carcinogenic potential for humans; • Chemicals which should be regarded as if they induce heritable mutations in the germ cells of humans; • Presumed human reproductive toxicant.	Acute toxicity category 2 (inhalation)	H330	$0.5 < LC_{50} \leq 2.0$ mg/l (vapours) $100 < LC_{50} \leq 500$ ppmV (gases) $0.05 < LC_{50} \leq 0.5$ mg/l (dusts/mists)
		Carcinogenicity category 1B	H350, H350i	
		Mutagenicity category 1B	H340	
		Reproductive toxicity category 1B	H360, H360D, H360F, H360FD, H360Fd, H360Df	
		Effects on or via lactation	H362	
		Specific target organ toxicity – repeated exposure category 1	H372	
		Respiratory sensitisation category 1	H334	

2b. Hazardous properties by dermal exposure

- Hazard by dermal exposure is categorised by effect of the chemical to dermal:
  - ✓Irritation
  - ✓Corrosion
  - ✓Sensitisation
  - ✓Acute toxicity
  - ✓Skin-absorption and other properties
  - Refer Table 2

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Table 2: Hazardous Properties by Dermal Exposure

Hazardous properties	Description	Corresponding hazard classification and H-code
Irritation	Chemicals which is irritating to skin or eyes) after contact	• Skin corrosion or irritation category 2 (H315) • Serious eye damage or eye irritation category 2 (H319)
Corrosion	Chemicals which have damaging effect on skin or eyes after contact	• Skin corrosion or irritation category 1 (H314) • Serious eye damage or eye irritation category 1 (H318)
Sensitisation	Chemicals which lead to allergic response following skin contact	• Skin sensitisation category 1 (H317)
Acute toxicity	Chemicals which cause adverse effect following dermal administration of a single dose of a chemical or multiple dose given within 24 hours	• Acute toxicity (dermal) category 1 (H310), • Acute toxicity (dermal) category 2 (H310); • Acute toxicity (dermal) category 3 (H311); • Acute toxicity (dermal) category 4 (H312)
Skin-absorption and other properties	Enter human body through dermal due to their physical chemical properties; Dermal application studies shown that absorption could cause systemic effect.	• Specific target organ toxicity-single exposure category 1* (H370) • Specific target organ toxicity-single exposure category 2* (H371) • Specific target organ toxicity-repeated exposure category 1* (H372) • Specific target organ toxicity-repeated exposure category 2* (H373) • Carcinogenicity category 1*(H350) • Carcinogenicity category 2*(H351) • Germ cell mutagenicity category 1*(H340) • Germ cell mutagenicity category 2*(H341) • Reproductive toxicity category 1*(H360, H360D, H360F, H360FD, H360Fd, H360Df) • Reproductive toxicity category 2*(H361, H361f, H361d, H361fd)

Note:
*to determine if hazard is due to dermal exposure

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Chapter 5: Assess Exposure

- Possible Routes of Exposure
- Evaluate Exposure for Inhalation
- Evaluate Exposure for Dermal
- Ingestion Assessment

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3 Change 3: Assess exposure for each route of exposure

- Evaluate exposure for inhalation
- Evaluate exposure for dermal
- Ingestion assessment

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Possible Routes of Exposure

- likelihood of exposure of workers in the work unit to CHTH through inhalation, dermal (contact or absorption) or oral/ingestion
- Factors to be considered:
  - physical form of the chemicals;
  - physicochemical properties of the chemicals;
  - nature of work;
  - working method;
  - working condition; and
  - work practices.
- focus on assessing exposure through inhalation and dermal

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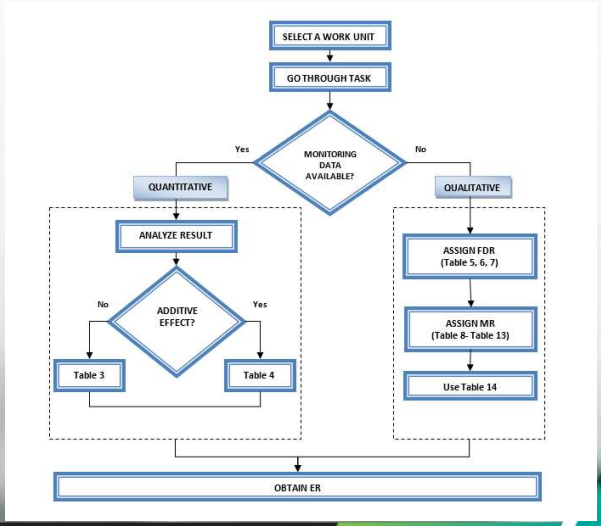
3a. Inhalation Exposure - Procedure to determine ER



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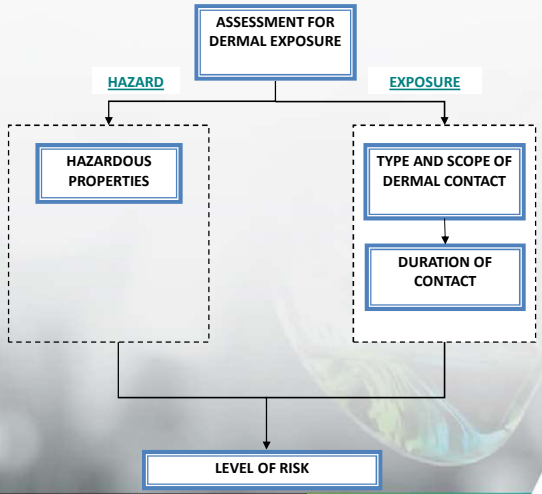
3b. Dermal Exposure - Procedure to evaluate



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Chapter 6: Risk Determination

- Level of Risk for Inhalation Exposure
- Level of Risk for Dermal Exposure

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Change 4: Risk determination for inhalation and dermal assessment

- Level of risk
  - High, Moderate or Low
- To determine level of risk for:
  - inhalation exposure
    - Risk matrix (Table 16) or
    - Risk equation (Risk = HR x ER)
  - dermal exposure
    - Risk matrix (Table 17)

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Table 16 : Level of risk for inhalation (Risk Rating)

		EXPOSURE RATING (ER)				
		1	2	3	4	5
HAZARD RATING (HR)	1	RR=1	RR=2	RR=3	RR=4	RR=5
	2	RR=2	RR=4	RR=6	RR=8	RR=10
	3	RR=3	RR=6	RR=9	RR=12	RR=15
	4	RR=4	RR=8	RR=12	RR=16	RR=20
	5	RR=5	RR=10	RR=15	RR=20	RR=25

Low Risk Level

Moderate Risk Level

High Risk Level

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Table 17: Risk Matrix for Dermal Exposure

Hazardous properties	Relevant H-code	Duration/ Extent of skin contact			
		Short-term (< 15 min)		Long-term (≥ 15 min)	
		Small area	Large area	Small area	Large area
Irritation	H315	L	M1	M1	M2
	H319	M1		M2	
Corrosive	H314	M1	H1	H1	H2
	H318	H1		H2	
Sensitisation	H317	L	M1	M2	H1
Acute toxicity	H312	M1	M1	M1	H1
	H311	M1	M1	M1	H1
	H310	H1	H1	H1	H2
Combination effect*	H310 with H314	H1	H1	H1	H2
Skin absorption and other properties**	H351	M1	M1	M2	H1
	H350	H1	H1	H1	H2
	H341	M1	M1	M2	H1
	H340	H1	H1	H1	H2
	H361, H361f, H361d, H361fd	M1	M1	M2	H1
	H360, H360F, H360D, H360FD, H360Fd, H360FD	H1	H1	H1	H2
	H370	H1	H1	H1	H2
	H371	M1	M1	M2	H1
	H372	M1	M1	M2	H1
	H373	L	M1	M2	M2

L: Low risk M: Moderate risk H: High risk

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Chapter 7: Control Measures

- Types of Control Measures
- Adequacy of Control Measures
- Specific Control Measures

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5 Change 5: Redefined control approaches

Technical Control	Organizational Control	Emergency Response & preparedness
• Elimination • Substitution • Total enclosure • Isolation • Modification of the process parameters • Application of engineering control equipment • Provision of personal protective equipment	• Safe work systems and practices • Information, instruction and training • Personal hygiene	• Emergency procedures • Medical emergency response

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Specific Control Measures

- Guidance on control measures for:
  - Carcinogenicity category 1
  - Respiratory sensitizer
  - Control of dermal exposure
  - Control of ingestion exposure

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Chapter 8: Exposure Monitoring Programme

- guidance to consider on the necessity of exposure monitoring programme

Chapter 9: Medical Surveillance Programme

- guidance to consider on the necessity of medical surveillance programme

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Chapter 10: Conclude, Recommend and Prioritise

- Assessment Conclusion
- Actions to be Taken
- Specific Actions to be Taken
- Action Priority

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6 Change 6: Assessment Conclusion

- Assessment concluded based on the level of risk and the adequacy of existing control measures:
  - High risk and adequately control
  - High risk and inadequately control
  - Moderate risk and adequately control
  - Moderate risk and inadequately control
  - Low risk and adequately control
  - Low risk and inadequately control

Action to be taken

- Based on the finding of the assessment, the assessor has to identify and recommend the required action to be taken by the employer on:
  - Measures and procedures required to control exposure to CHTH;
  - Measures, procedures and equipment necessary to control any accidental emission of CHTH as a result of leakage, spillage, process or equipment failure;
  - Necessity for worker exposure monitoring programme and medical surveillance programme; and
  - Requirement for the training and retraining of workers.

Specific Action to be taken

- Known human carcinogens and respiratory sensitizers
- Immediate danger to life or property; and
- Where level of risk could not be determined.

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7 Change 7: Action Priority (AP)

- Action priority was introduced to prioritize the action to be taken by employer to control exposure to CHTH
- Assessor should assign AP for each identified action to be taken
- Employer should use the AP assigned when preparing the action plan on implementation of control measures
- AP is assign based on the level of risk and adequacy of control measures

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Action Priority Levels

- 3 levels of AP

Action Priority (AP)	Level of Risk	Adequacy of Control
1	High	Inadequate
2	Moderate/Low	Inadequate
3	High/Moderate/Low	Adequate

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Chapter 11: Report Writing

- Report Title Page
- Executive Summary
- Table of Contents
- Introduction
- Process and Work Unit Description
- Assessment Methodology
- Assessment Findings
- Discussion
- Recommendation on Action to be Taken
- References
- Appendices

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Summary of Main Changes in Manual CHRA 3rd Edition

- ❑ Work unit definition clarified
- ❑ Hazard determination for each route of exposure
- ❑ Exposure evaluation for each route of exposure
- ❑ Risk determination for inhalation and dermal assessment
- ❑ Control approaches redefined
- ❑ Conclusion of assessment redefined
- ❑ 3 action priority introduced to prioritize the action to be taken by employer

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Other addition/improvement and changes to CHRA Manual

- Assessment specific to route of exposure
- Recommendation on action to control exposure
- Emphasis on exposure monitoring and medical surveillance programme
- Control of records
- Reassessment

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THANK YOU FOR YOUR ATTENTION

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